CLAIMS

[1]

A multiaxial sensor for measuring one or more of multiaxial force, moment, acceleration, and angular acceleration, externally applied, characterized by comprising:

a plurality of strain gauges disposed on one plane.

[2]

The multiaxial sensor according to claim 1, characterized by further comprising a first diaphragm to which the plurality of strain gauges are attached.

[3]

The multiaxial sensor according to claim 2, characterized in that first diaphragms are arranged around a central point of the plane at regular angular intervals and at the same distance from the central point.

[4]

The multiaxial sensor according to claim 3, characterized in that the angular interval is 90 degrees.

[5]

The multiaxial sensor according to claim 4, characterized in that the diaphragms are disposed in positive and negative directions on X and Y axes with an origin being defined at the central point.

[6]

The multiaxial sensor according to claim 3, characterized in that the angular interval is 120 degrees.

[7]

The multiaxial sensor according to any of claims 2 to 6, characterized in that a thin portion of each first diaphragm is annular and provided with eight strain gauges, and

the strain gauges are disposed at outer and inner edge portions of the first diaphragm on a line extending between a central point of the first diaphragm and the central point of the plane, and at outer and inner edge portions of the first diaphragm on a line perpendicular to the former line at the central point of the first diaphragm.

[8]

The multiaxial sensor according to any of claims 2 to 7, characterized in that the multiaxial sensor further comprises an operative body provided on a central portion of the first diaphragm, and

multiaxial accelerations and angular accelerations applied to the multiaxial sensor are measured.

[9]

The multiaxial sensor according to any of claims 2

to 7, characterized in that the multiaxial sensor further comprises:

a first member comprising the first diaphragm;

a second member comprising a second diaphragm opposed to the first diaphragm and provided with no strain gauges; and

a connecting shaft connecting the opposed first and second diaphragms, and

multiaxial forces and moments applied between the first and second members are measured.

[10]

The multiaxial sensor according to any of claims 2 to 7, characterized in that the multiaxial sensor further comprises:

a first member comprising the first diaphragm;

a second member comprising a second diaphragm opposed to the first diaphragm and provided with a plurality of strain gauges disposed on one plane, and

a connecting shaft connecting the opposed first and second diaphragms; and

multiaxial forces and moments applied between the first and second members are measured.

[11]

The multiaxial sensor according to claim 10,

characterized in that the strain gauges of the first member and the strain gauges of the second member are disposed symmetrically with respect to a barycentric point of the multiaxial sensor.

[12]

The multiaxial sensor according to claim 11, characterized in that either outputs of the strain gauges of the first member and the strain gauges of the second member are adopted if the other outputs are out of a predetermined range.

[13]

The multiaxial sensor according to claim 2, characterized in that only one diaphragm is disposed on the plane.

[14]

The multiaxial sensor according to claim 13, characterized in that the multiaxial sensor further comprises operative bodies being in contact with the first diaphragms at positions arranged around the central point of the plane at regular angular intervals and at the same distance from the central point, and

multiaxial accelerations and angular accelerations applied to the multiaxial sensor are measured.

[15]

The multiaxial sensor according to claim 13, characterized in that the multiaxial sensor further comprises:

a first member comprising the first diaphragm;

a second member comprising only one second diaphragm provided with no strain gauges; and

operative bodies connecting the first and second diaphragms,

the first and second members are disposed so that a central point of the first diaphragm of the first member is opposed to a central point of the second diaphragm of the second member, and

the operative bodies connects the first and second diaphragms at positions arranged around the central points of the first and second diaphragms at regular angular intervals and at the same distance from the central points, and multiaxial forces and moments applied between the first and second members are measured.

[16]

The multiaxial sensor according to claim 13, characterized in that the multiaxial sensor further comprises:

a first member comprising the first diaphragm;

a second member comprising a second diaphragm

provided with a plurality of strain gauges disposed on one plane; and

operative bodies connecting the first and second diaphragms,

the first and second members are disposed so that a central point of the first diaphragm of the first member is opposed to a central point of the second diaphragm of the second member, and

the operative bodies connects the first and second diaphragms at positions arranged around the central points of the first and second diaphragms at regular angular intervals and at the same distance from the central points, and multiaxial forces and moments applied between the first and second members are measured.

[17]

The multiaxial sensor according to claim 16, characterized in that the strain gauges of the first member and the strain gauges of the second member are disposed symmetrically with respect to a barycentric point of the multiaxial sensor.

[18]

The multiaxial sensor according to claim 17, characterized in that either outputs of the strain gauges of the first member and the strain gauges of the second

member are adopted if the other outputs are out of a predetermined range.

[19]

The multiaxial sensor according to any of claims 14 to 18, characterized in that the angular interval is 90 degrees.

[20]

The multiaxial sensor according to claim 19, characterized in that the operative bodies are disposed in positive and negative directions on X and Y axes with an origin being defined at the central point of the first diaphragm.

[21]

The multiaxial sensor according to any of claims 14 to 18, characterized in that the angular interval is 120 degrees.

[22]

The multiaxial sensor according to any of claims 14 to 21, characterized in that the strain gauges are disposed:

at edge portions of the operative bodies on a line extending between a central point of a portion on the plane corresponding to the operative bodies, and the central point of the first diaphragm;

at edge portions of the operative bodies on a line perpendicular to the former line at the central point of the portion on the plane corresponding to the operative bodies; and

at either of edge portions of the operative bodies and edge portions of the first diaphragm, at positions arranged around the central point of the first diaphragm at regular angular intervals and at the same distance from the central point.

[23]

The multiaxial sensor according to any of claims 1 to 22, characterized in that each of the strain gauges is made of a piezoresistance element.

[24]

The multiaxial sensor according to any of claims 1 to 22, characterized in that each of the strain gauges is made of a thin film of chromium oxide formed on an insulating film.